IUE Low Dispersion Sensitivty Monitoring. XII.

Introduction

Analysis of IUE low dispersion sensitivity monitoring data for the three active cameras has been updated to November 1986 for the LWR and to May 1987 for the LWP and SWP. The SWP camera sensitivty is monitored by analyzing data from four standard stars:

BD +28 4211, HD 93521, HD 60753, BD +33 2642.

The LWP and LWR camera sensitivity changes have been analyzied using the following four standard stars:

BD +28 4211, HD 93521, HD 60753, BD +75 325.

In Figures 1-5 the data for the four stars for each camera are represented, respectively, by:

plus sign, asterisk, diamond, square.

The method of analysis is the same as that used in previous reports (Holm and Schiffer, 1980; Sonneborn and Garhart 1986). For the SWP and LWR cameras, each spectrum is ratioed to a reference spectrum and placed into three wavelength bins. The binned flux ratios are then fit with a multiple linear regression to find the percent change per year in sensitivity (the time dependence) for each bandpass and the overall temperature dependence of the camera. The LWP fluxes are binned into six bandpasses 150A wide. The flux ratios for each bandpass and star are normalized to 1.0 at the initial epoch.

Results

Table 1 lists the temperature and time dependence for the three cameras along with the same parameters from previous reports. Figures 1-4 show the results for the different bandpasses for each camera. The plotted flux ratios have been normalized to 1978 and corrected for camera temperature (THDA) dependence. The temperature correction was applied relative to the THDA of the reference spectrum for each star.

The LWP results are plotted in Figures 1 and 2. The addition of recent data strengthens the view that there was an abrupt jump in LWP sensitivity in late 1983 when the camera usage increased dramatically. Since that time there appears to have been either no change or a gradual downward trend in LWP sensitivity in most bandpasses. The short wavelength end of the camera (2075-2225 A) still shows a slight rise in sensitivty, although not as much as in prior analyses.

The LWR sensitivity degradation, as shown in Figure 3, shows little change over previous values. However, the scatter in the last two years' data is significant. In the 2400 and 2900 A bandpasses the points for 1986 lie systematically above the regression line, although this could be just a statistical fluctuation.

SWP sensitivity data (Figure 4) shows a decrease in sensitivity for all wavelength regions. The rate of degradation is now statistically larger in all bandpasses than in the last report. The starting date for the linear regression was 1980.0.

The camera head amplifier temperatures (THDA) have also been monitored for temporal variations. There is a general trend for rising spacecraft temperatures since launch. The current mean THDA values for the three cameras are:

LWP (1987.3) =	9.8 °C	-399.35±117.59 + 0.2059±0.0593 t
LWR (1986.9) =	14.9 °C	-542.60±83.76 + 0.2806±0.0423 t
SWP (1987.3) =	9.6 °C	-308.54±82.85 + 0.1601±0.0418 t

The equations, to the right of the mean THDA values above, are the linear, least squares fits to the THDA data (1978-1987.4), where t is the date in decimal years. These regression lines are shown in Figure 5. However, when the least-squares analysis is restricted to dates after 1980 we find that there is little statistical evidence for the THDA increasing with time; the only significant changes appear to have taken place in 1978-1980. The linear least-square fits to the THDA data (LWR,SWP: 1981-1987.4, LWP: 1983-1987.4) are:

LWP	THDA(t) =	-22.47±166.05 + 0.0161±0.0836 t
LWR	THDA(t) =	-225.62±146.52 + 0.1209±0.0739 t
SWP	THDA(t) =	118.45±126.86 - 0.0550±0.0639 t

We conclude that the mean camera temperatures have been constant for the past 6 years (4 years for the LWP).

George Sonneborn and Matthew P. Garhart
28 May 1987

References

Holm, A.V. and Schiffer, F.H. 1980. NASA IUE Newsletter No.9, p.8
Sonneborn, G. 1984. "Low-Dispersion Quick-Look Sensitivity Monitoring. VIII.", NASA IUE Newsletter No.24, p. 67.
Sonneborn, G. and Garhart, M.P. 1986. "Low-Dispersion Quick-Look Sensitivity Monitoring. XI.", NASA IUE Newsletter No.31, p.29

Table 1.

Results of LWP, LWR, and SWP sensitivity analysis - June 1987

LWP CAMERA

Temperature dependence = -0.29 ± 0.04 %/°C
RMS error for a single observation = 2.8 %
220 Data points used in regression

Wavelength region (A)	Time dependence (%/yr.) 1980.4 through 1987.3	1986.4	1985.3	1984.2
2075 - 2225	+0.11±0.07	+0.20±0.09	+0.29±0.11	-0.09±0.15
2225 - 2375	-0.30±0.06	-0.22±0.09	-0.06±0.11	-0.61±0.15
2375 - 2525	-0.44±0.07	-0.42±0.09	-0.27±0.11	-1.05±0.15
2525 - 2675	-0.61±0.06	-0.48±0.09	-0.13±0.11	-0.84±0.15
2675 - 2825	-0.33±0.07	-0.11±0.09	+0.24±0.11	-0.03±0.15
2825 - 2975	-0.03±0.06	+0.11±0.09	+0.39±0.11	+0.15±0.15

LWR CAMERA

Temperature dependence = -0.73 ± 0.04 %/°C
RMS error for a single observation = 3.3 %
254 Data points used in regression

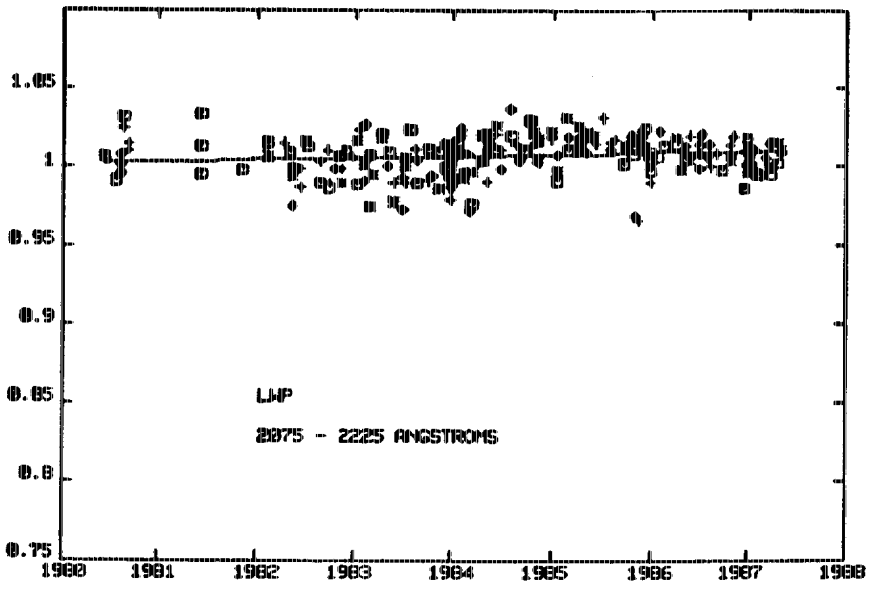
Wavelength region (A)	Time dependence (%/yr.) 1978.6 through 1986.9	1986.4	1985.3	1984.2
2250 - 2550	-2.39±0.06	-2.49±0.08	-2.23±0.10	-2.45±0.09
2550 - 2650	-1.70±0.06	-1.73±0.08	-1.69±0.10	-1.36±0.09
2750 - 3050	-1.63±0.06	-1.73±0.08	-1.84±0.10	-1.35±0.09

SWP CAMERA

Temperature dependence = -0.49 ± 0.04 %/°C
RMS error for a single observation = 3.2 %
255 Data points used in regression

Wavelength region (A)	Time dependence (%/yr.) 1980.0 through 1987.3	1986.3	1985.3	1984.2
1225 - 1375	-0.80±0.06	-0.66±0.06	-0.69±0.08	-0.72±0.13
1475 - 1625	-0.44±0.06	-0.22±0.06	-0.17±0.08	-0.16±0.13
1775 - 1925	-0.80±0.06	-0.69±0.06	-0.63±0.08	-0.86±0.13

Figure 1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1
0.95
0.9
0.85
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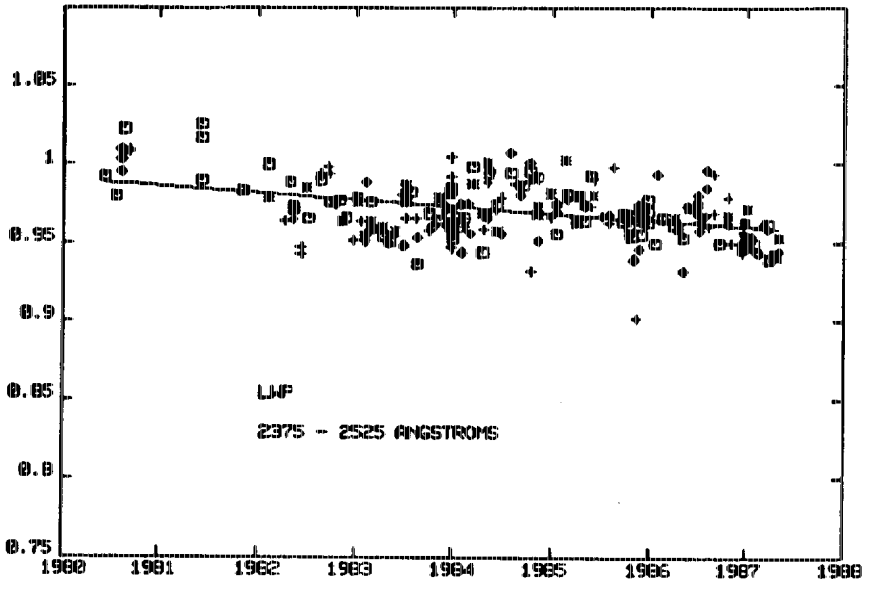
0.75
1980
1981
1982
1983
1984
1985
1986
1987
1988
LWP
2875 - 2225 ANGSTROMS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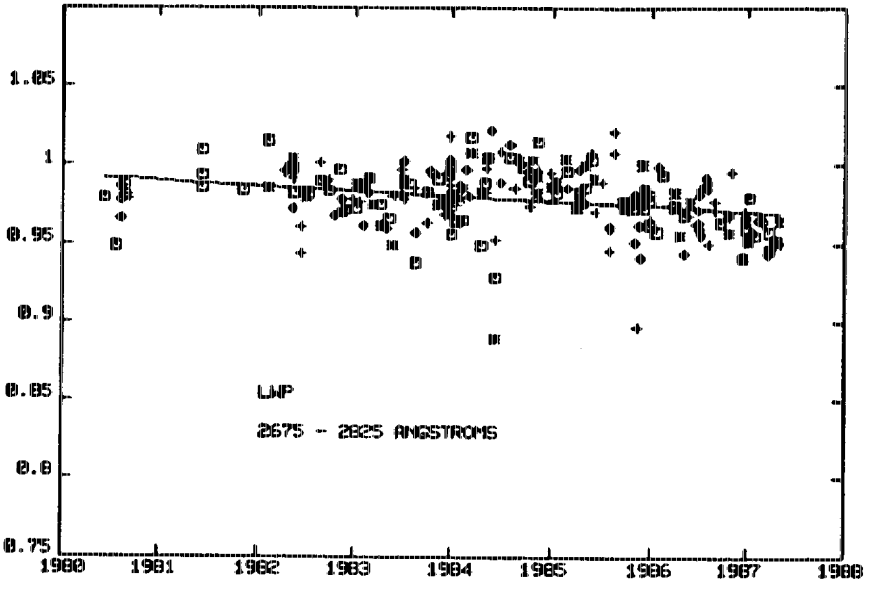
1981
1982
1983
1984
1985
1986
1987
1988
LWP
2375 - 2525 ANGSTROMS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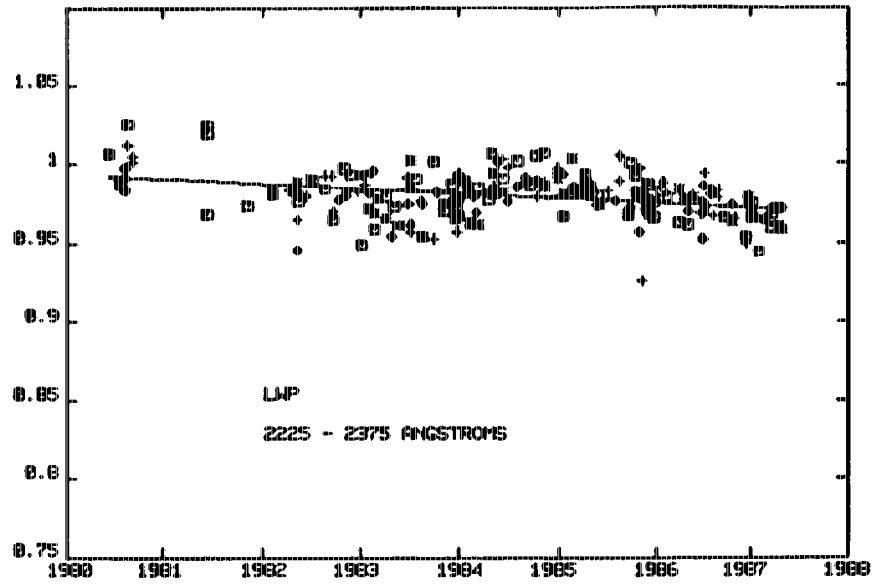
1981
1982
1983
1984
1985
1986
1987
1988
LWP
2675 - 2825 ANGSTROMS

Figure 2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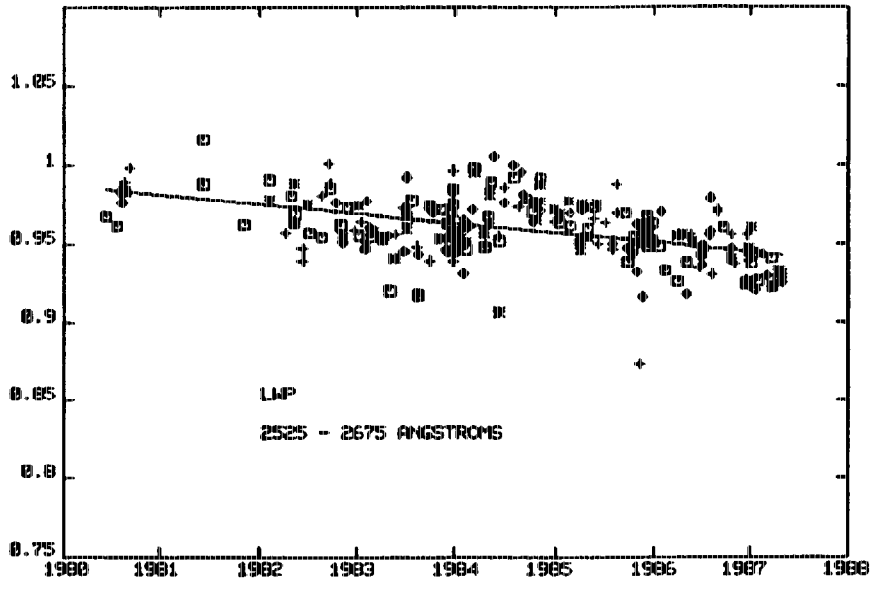
2225 - 2375 ANGSTROMS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1982
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1984
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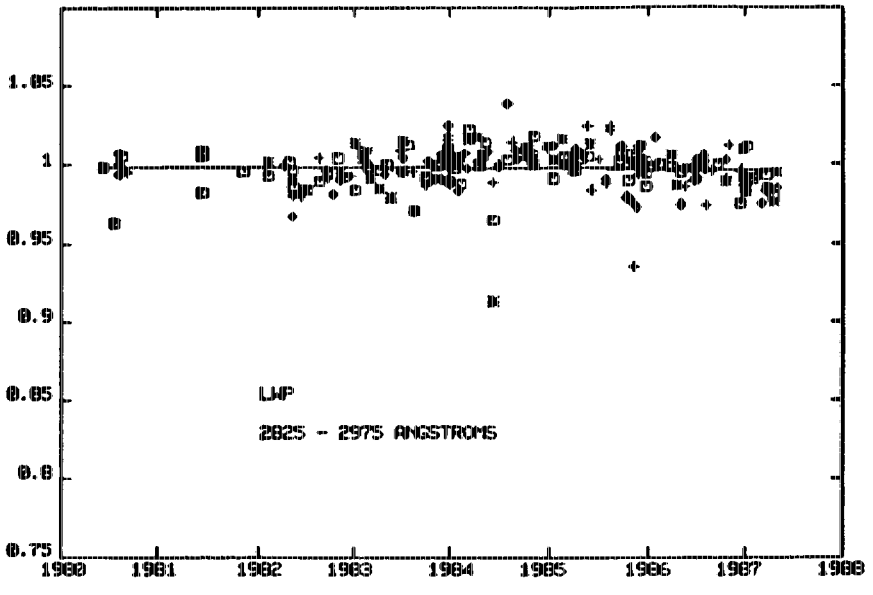
LWP
2525 - 2675 ANGSTROMS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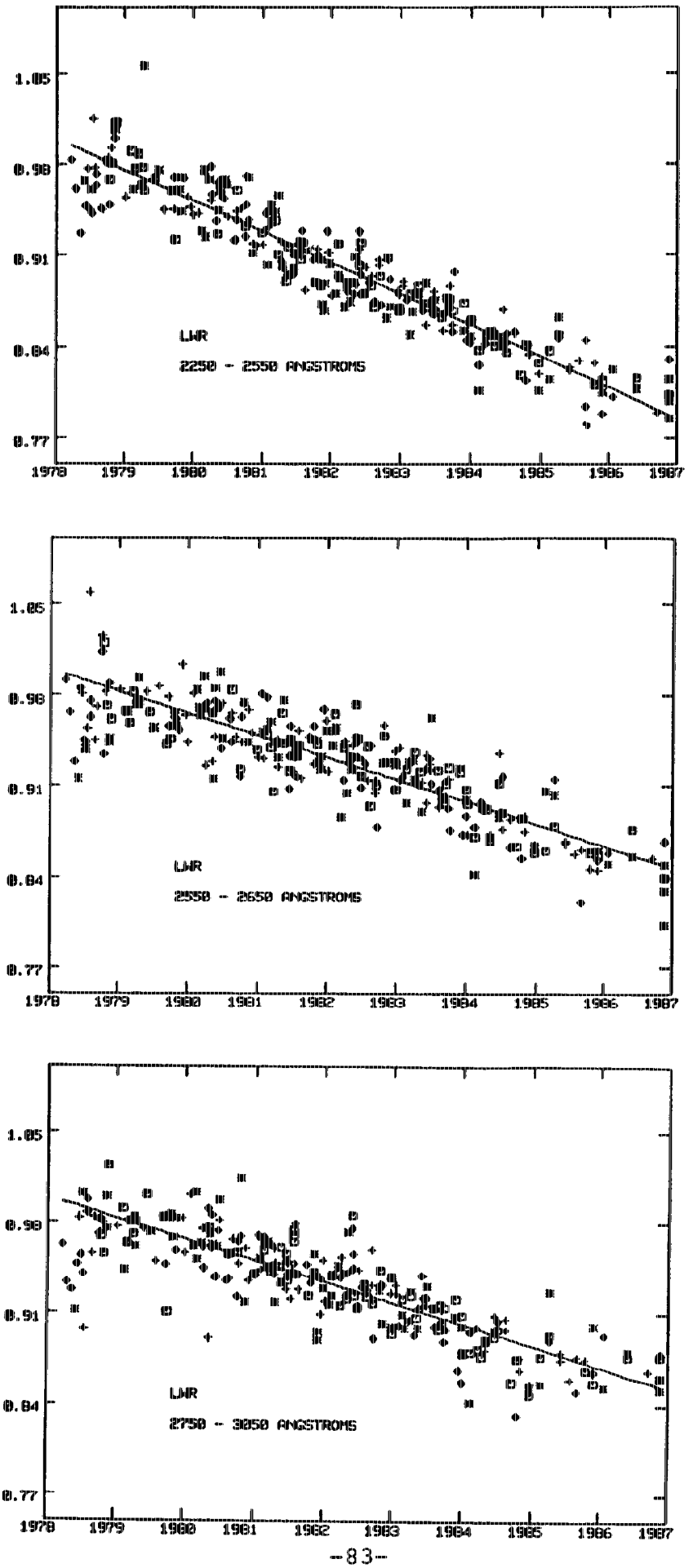
1987
1988
LWP
2825 - 2975 ANGSTROMS

Figure 3


1.05
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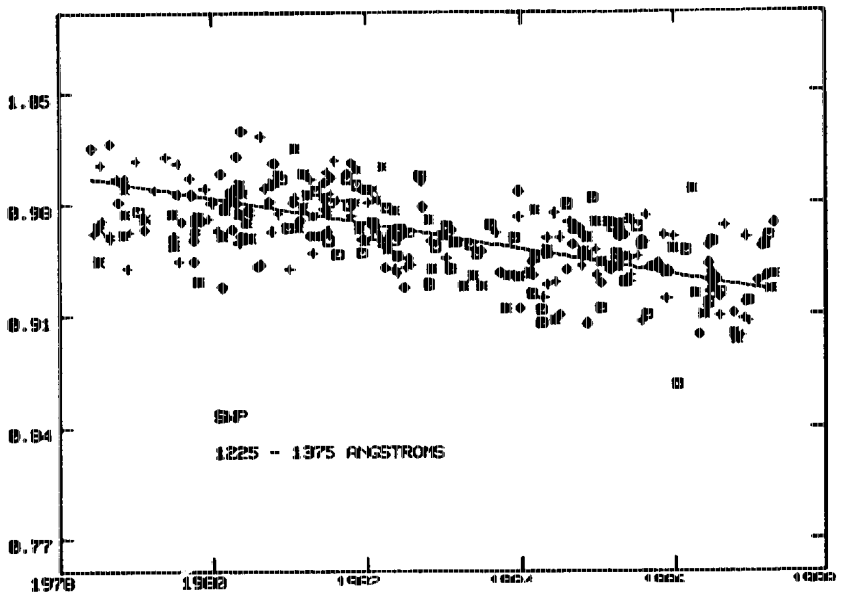
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
LWR
2250 - 2550 ANGSTROMS
LWR
2550 - 2650 ANGSTROMS
LWR
2750 - 3050 ANGSTROMS

Figure 4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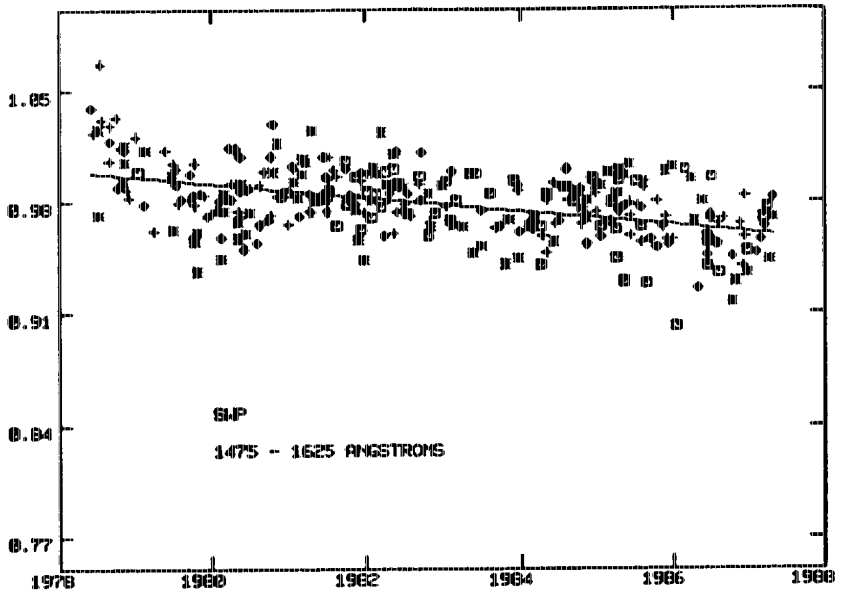
SWP
1225 - 1375 ANGSTROMS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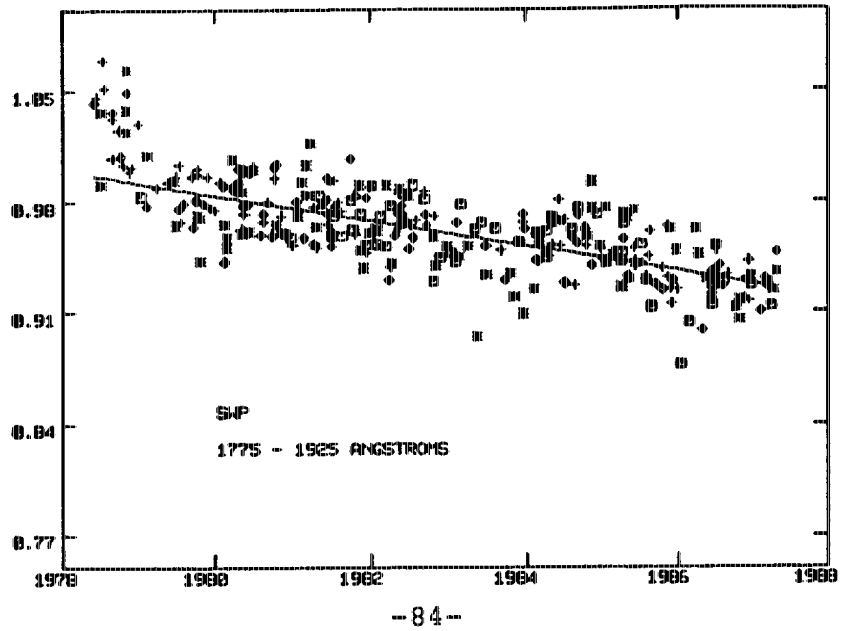
1986
1988
SWP
1475 - 1625 ANGSTROMS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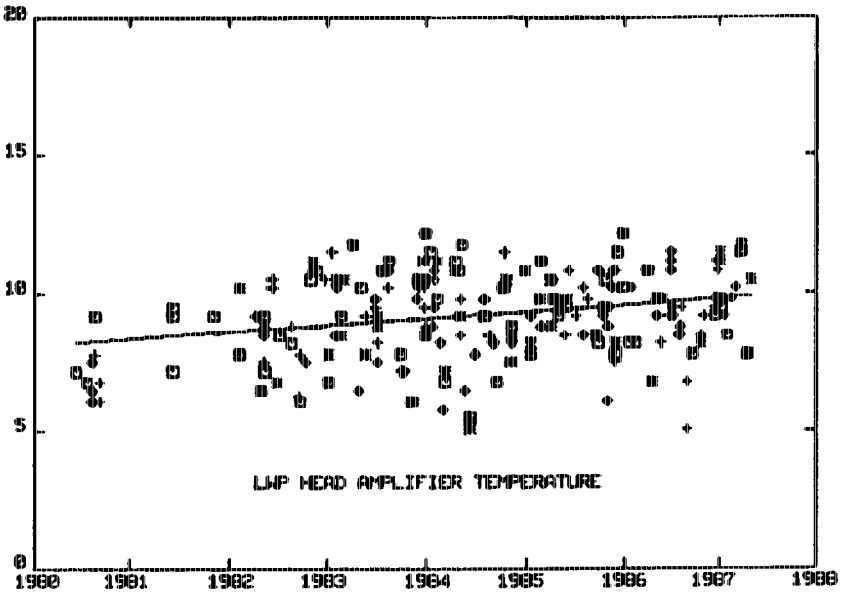
1982
1984
1986
1988
SWP
1775 - 1925 ANGSTROMS

Figure 5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10
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LWP HEAD AMPLIFIER TEMPERATURE
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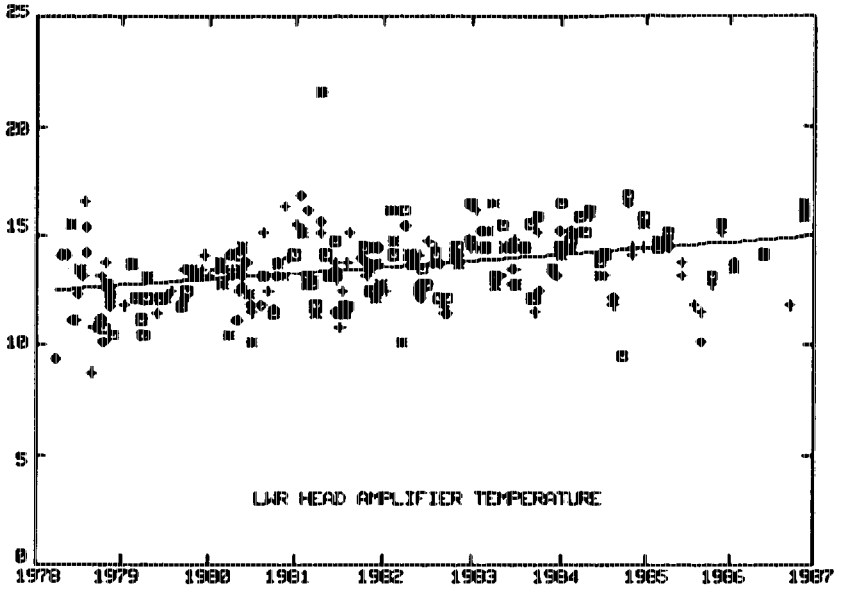
1981
1982
1983
1984
1985
1986
1987
1988


25
20
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LWR HEAD AMPLIFIER TEMPERATURE
1978
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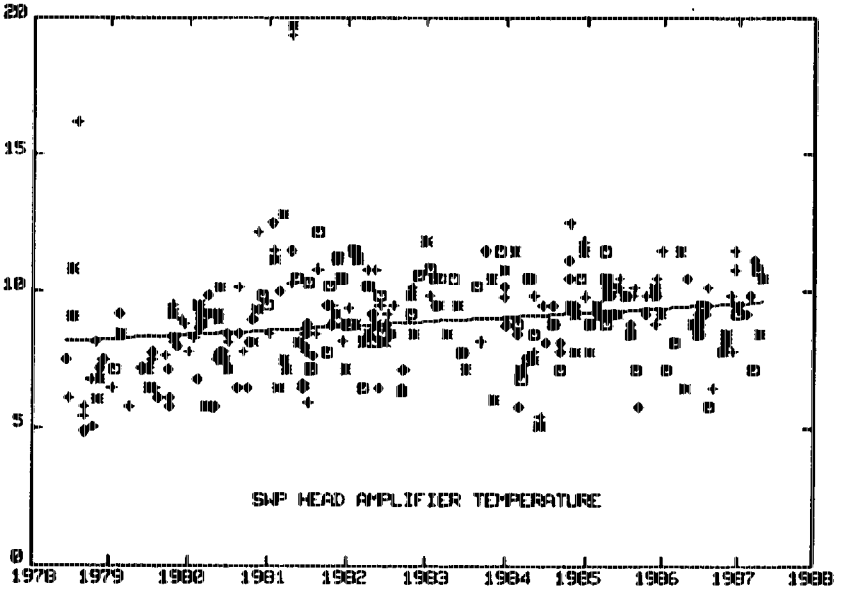
1987


20
15
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0
SWP HEAD AMPLIFIER TEMPERATURE
1978
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